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108

Cavity wall insulating material - is a mixt. of spherical beads e.g. of expanded polystyrene or polyurethane, with a fibrous second component

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Cavity wall insulating material comprises a main mass of substantially spherical beads (I) mixed with a minor proportion of a second component (II) of the same or different material, having a different vol. and shape to the (I). Pref. (I) is beads of polyurethane or expanded polystyrene with an average dia. of 2-5 mm and (II) is either fibrous or granules of a random or regulare shape such as rectangular, plate-like, saucer-shape or saddle-shape. Pref. (II) is a fibrous component of cellulose, rockwool, glass or polymeric fibres, used in an amt. of 0.1-20 wt. % w.r.t. the bulk vol. of the whole insulating material.

USE/ADVANTAGES

The compsn. retains the free flowing nature of the granules (I) so that it can be installed through a relatively few holes at the top of the wall, whilst the second component (II) prevents drainage of the (I) from around joist ends or service pipes and ducts, or in the case of a breach in the wall. Prevention of leakage is prevented without the application of large amts. of adhesive to the granules as in prior art processes, which detracts from the free flowing nature of the granules.

DETAIL

The granules may be formed as clusters or agglomerates from the main mass of beads by injecting small discrete amts. of an adhesive into the beads over intervals of space and or time.

EXAMPLE

A test cavity wall was made (4m x 3m) with a cavity of 65 mm. Apertures were left in the base of the wall simulating missing brick, half brick, quarter brick and mortar sections, horizontal and vertical. A mixt. of 95% expanded polystyrene beads and 5% rockwool in small tufts and single fibres was blown into the cavity. Less than 0.5% of the material flowed through the apertures. The material took up a repose angle of 45 deg. in the aperture so that no flow occurred. When flow was induced

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with a vacuum device, flow ceased within 1 second of the device being removed.(9pp513).
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(54) Cavity wall insulation.

(57) This invention relates to a cavity wall insulating material which is a mixture of a main mass of spherical beads and a minor amount of a second component having a different volume and a dissimilar shape from the beads. The second component may be fibrous or granular. The beads may be expanded polystyrene and the second component may be of natural or synthetic material. A fibrous second component is preferred. In either case the presence of the second component prevents the wall from being drained of the insulating material because it gives the mixture a larger repose angle.

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CAVITY WALL INSULATION

The present invention relates to free flowing insulants for cavity walls.

Thermal insulation of masonry cavity walls has assumed great importance in view of the enormous increase in fuel costs in recent years for domestic and industrial heating. Several types of insulating materials and methods are now available for this purpose.

The specific insulant to be used will be determined by the degree of insulation desired, the accessibility of the cavity, the environment to which the wall enclosing the cavity is exposed and the cost of insulation. Of these, the accessibility of the cavity is important. For example, if the insulation is to be carried out during the construction of a wall, it has been the practice to use slabs or boards of the insulant; on the other hand, a completed wall is usually insulated by inserting the material into the cavity by blowing or injection for instance in granular or bead form.

Where granular or bead-like insulants are used they may be of polyurethane or expanded polystyrene. Beads when used alone are free flowing and therefore need only a few holes at the top of the wall to fill the entire cavity, and are capable of being adapted to both old and new walls. The main problem with this type of insulant is that the free flowing nature of the insulant can lead to unnoticed escape of the insulant from around joist ends or service pipes and ducts, and the insulant can drain out of the cavity system completely in the case of a breach in the wall. In order to overcome this problem it has been suggested to coat the beads thinly with an adhesive as the fill enters the wall. The adhesive sets and prevents further escape. The use of an adhesive coating, however, detracts from the free flowing

property of the beads which is the main feature of such insulants. Granular insulants, as distinct from beads, are produced cheaply by shredding waste boards. However, when used alone, they are not sufficiently free flowing and may also have a tendency to produce moisture transfer across the cavity. Therefore, there has been reluctance to use granular insulants.

It has now been found that the deficiencies of granular insulants, and the tendency of bead insulants to drain from cavity walls through obvious breaches and unnoticed holes, can be mitigated without the use of substantial amounts of adhesives and without the loss of their free flowing properties.

Accordingly, the present invention is a cavity wall insulating material comprising a main mass of substantially spherical beads admixed with a minor proportion of granules of the same or different material having a volume substantially different from and being dissimilar in shape from the beads.

The beads forming the main mass of the insulating material are suitably made of polyurethane or expanded polystyrene and preferably have an average diameter of between 2mm and 5mm.

The second component in the insulating material may have any shape other than spherical. For example, it may be fibrous or granular. If granular, it may have a completely random shape or it may have a regular or symmetrical shape such as rectangular, plate-like, saucer-shaped, or saddle-shaped. The granular component may be preformed or prepared 'in situ' e.g. while pumping the material into the wall to be insulated. Thus granules may be produced from the main mass of beads by injecting into the beads over intervals of time and/or space small discrete quantities of an adhesive so as to encourage formation of small agglomerates or clusters which resemble the granules as distinct from beads. Alternatively, the clusters may be formed by applying heat to some of the beads so as to bind them together and these may be subsequently broken up to produce clusters of the desired size and shape. It is important that the ultimate mixture of the granules (whether preformed or in the form of clusters or agglomerates) and beads in the insulating material retain their respective free flowing characteristics.

If a granular second component is used the volume of a granule is substantially greater than the volume of a bead in the insulating material. The average volume ratio in repect of the surface area of an individual granule to that of an individual bead is suitably greater than 5, preferably between 10 and 40, most preferably between 15 and 30.

The amount of granules in the admixed insulating material is suitably between 2 and 20%, preferably between 5 and 15% by weight of the total insulating material.

If a fibrous second component is used, the fibres may be of mineral and/or synthetic material. Examples of mineral fibres include rockwool, cellulose and glass fibres, whereas examples of synthetic material include polyester or polyamide fibres or polyolefin fibres. Whichever type of fibre is used the relative length and cross-section of the fibre is not relatively significant in the context of the present invention. The average volume of a single strand of the fibre is usually less than that of a bead. The amount of the fibrous component in the admixed insulating material is suitably between 0.5 and 20%, preferably between 1 and 10% based on the bulk volume of the total insulating material.

The insulating material of the present invention may be incorporated into a cavity wall by any one of the conventional techniques. Specifically recommended is the technique claimed and described in our published British Patent Application No 2012620A according to which the insulating material is injected into a cavity wall using compressed air and a Coanda nozzle. The use of this technique prevents the breakdown of the beads and granules into a powdery mass by attrition as sometimes experienced during the filling operations.

The present invention is further illustrated with respect to the following Examples.

<u>Example 1</u>

A test cavity wall, (2m x 2m) made of sheets of perspex was constructed which had a cavity 50 mm wide closed at both ends. At the base of this wall was drilled a hole (50 mm diameter) in the leaf and

the hole was plugged. The cavity was then filled with a mixture of free flowing beads (average diameter 4 mm) and saddle-shaped granules (5 mm thick, 30 mm long and 20 mm wide), the granules forming 10% by weight of the total insulant. After filling the cavity, the plug was removed from the hole. On removal of the plug, less than 0.1% by weight of the beads escaped and the escape ceased within 5 seconds of removing the plug.

In a Comparative Test (not according to the invention) the hole was again plugged and this time the cavity wall was filled with the same free flowing beads alone without the granules. On removal of the plug the beads drained from the wall until the wall was substantially empty.

Example 2

A test cavity wall (4m x 3m) rig composed of a single brickwork leaf, and a modular transparent (perspex) leaf, was construced, with a test cavity of 65 mm. At the lower section of the transparent face, a small modular brick wall was constructed, with several apertures, simulating a missing brick, half brick, quarter brick, and mortar sections, horizontal and vertical. These apertures were left open during cavity filling operations.

(a) Using the test rig above, a mixture of expanded polystyrene beads (95%), and rockwool mineral fibres (5% in small tufts and single fibres, well dispersed in the beads) was blown into the cavity. Less than 0.5% of the material flowed through the apertures. The material took up a repose angle of approximately 45° in the apertures so that no flow occurred. If flow was induced by using a vacuum device, the material ceased to flow within one second of the device being removed.

(b) The same rig as in (a) above was used with a mixture of rockwool fibres (2%) in expanded polystyrene beads and similar results were obvserved.

(c) The same rig as in (a) above was used with a mixture of expanded polystyrene beads (95%), and small clusters of expanded polystyrene beads bonded together with adhesive to form granules. The repose angle obtained in this case was in the range 60 - 90°.

(d) Test (c) above was repeated using expanded polystyrene beads (98%)

and granules (2%) produced from the same beads but bonded by application of heat and the bonded material was then broken into small clusters. The repose angle of this mixture remained between 60 and 90°.

Claims:

1. A cavity wall insulating material comprising a main mass of substantially spherical beads admixed with a minor proportion of a second component of the same or different material having a volume substantially different from and being dissimilar in shape from the beads.
2. An insulating material according to claim 1 wherein the beads are made of polyurethane or expanded polystyrene.
3. An insulating material according to claim 1 or 2 wherein the beads have an average diameter of between 2 mm and 5 mm.
4. An insulating material according to any one of the preceding claims wherein the second component is either fibrous or granules of a random or regular shape.
5. An insulating material according to claim 4 wherein the granules have a shape selected from rectangular, plate-like, saucer-shape and saddle-shape.
6. An insulating material according to claim 5 wherein the granules are formed as clusters or agglomerates from the main mass of beads by injecting small, discrete quantities of an adhesive into the beads over intervals of space and/or time.
7. An insulating material according to any one of the preceding claims 4 - 6 wherein the average volume ratio in respect of the surface area of an individual granule to that of an individual bead is greater than 5:1.
8. An insulating material according to any one of the preceding claims 4 - 7 wherein the amount of granules is between 2 and 20% by weight of the total insulating material.

9. An insulating material according to claim 4 wherein the fibrous component is made from mineral and/or synthetic material selected from cellulose, rockwool, glass and polymeric fibres.

10. An insulating material according to claim 4 or 9 wherein the amount of the fibrous component is between 0.1 and 20% based on the bulk volume of the total insulating material.

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EUROPEAN SEARCH REPORT

0045216

Application number

EP 81 30 3457.6

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	FR - A1 - 2 401 889 (JOHNS-MANVILLE CORP.) * claim 10; page 4, lines 10 to 14 * --	1,2,4, 9,10	E 04 B 1/76 C 04 B 43/00 F 16 L 59/04
	AU - A - 11 963/66 (GREFCO LTD.) * claims * --	1,4,9, 10	
A	US - A - 3 950 259 (PALLO et al.) --		TECHNICAL FIELDS SEARCHED (Int. Cl.³)
A	Patents Abstracts of Japan Vol. 3, No. 84, 20 July 1979 page 144M66 & JP - A - 54 - 62553 ----		C 04 B 43/00 E 04 B 1/00 E 04 B 2/00 F 16 L 59/04

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Berlin	06-10-1981	HÖRNER